

## CLAIMS

We claim:

1. A method for making a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said method comprising the steps of:  
providing a nanocrystal precursor that comprises a core having a surface that includes a sufficient amount of a solubility agent to render said nanocrystal precursor soluble in an organic solvent; and  
coating the surface of said nanocrystal precursor with a sufficient amount of an inorganic capping agent to form said nanocrystal, wherein said coating of the surface of said nanocrystal precursor with said inorganic capping agent takes place in the presence of an organic solvent.
2. A method for making a nanocrystal according to claim 1 wherein the core of said nanocrystal precursor comprises a semiconductor material selected from the group consisting of CdTe, CdHgTe, HgTe and mixtures thereof.
3. A method for making a nanocrystal according to claim 1 wherein said inorganic capping agent is selected from the group consisting of CdS, ZnS and mixtures thereof.
4. A method for making a nanocrystal according to claim 2 wherein said inorganic capping agent is selected from the group consisting of CdS, ZnS and mixtures thereof.
5. A method for making a nanocrystal according to claim 1 wherein said solubility agent is a long chain aliphatic thiol.
6. A method for making a nanocrystal according to claim 4 wherein said semiconductor material is CdTe, CdHgTe or HgTe and said capping agent is ZnS.

7. A method for making a nanocrystal according to claim 1 wherein said nanocrystal precursor is made by a method comprising the steps of:
  - providing a water soluble nanocrystal that comprises a core and a surface wherein said surface comprises stabilizing molecules; and
  - treating said water soluble nanocrystal with a sufficient amount of said solubility agent in the presence of a surfactant to replace at least a portion of said stabilizing molecules with said solubility agent to thereby provide said nanocrystal precursor that is soluble in an organic solvent.
8. A method for making a nanocrystal according to claim 7 wherein said stabilizing molecules comprise short chain thiols.
9. A method for making a nanocrystal according to claim 8 wherein said solubility agent comprises a long chain thiol.
10. A method for making a nanocrystal according to claim 9 wherein said solubility agent comprises dodecanethiol.
11. A method for making a nanocrystal according to claim 7 wherein said surfactant comprises acetone.
12. In a method for making a nanocrystal where a core is first formed and then coated with an inorganic capping agent, the formation of said core and the coating of said core with said inorganic capping agent being both carried out in the presence of an organic solvent, the improvement comprising:
  - forming said core in an aqueous solvent instead of an organic solvent to thereby provide a water soluble core; and
  - treating said water soluble core with a sufficient amount of a solubility agent in the presence of a surfactant so that said water soluble core is converted into a core that is soluble in organic solvents whereby said core can then be coated with said inorganic capping agent in the presence of said organic solvent.

13. An improved method for making a nanocrystal according to claim 12 wherein said core that is formed in aqueous solvent comprises a semiconductor material selected from the group consisting of CdTe, CdHgTe, HgTe and mixtures thereof.
14. An improved method for making a nanocrystal according to claim 12 wherein said inorganic capping agent is selected from the group consisting of CdS, ZnS and mixtures thereof.
15. An improved method for making a nanocrystal according to claim 13 wherein said inorganic capping agent is selected from the group consisting of CdS, ZnS and mixtures thereof.
16. An improved method for making a nanocrystal according to claim 12 wherein said solubility agent is a long chain aliphatic thiol.
17. An improved method for making a nanocrystal according to claim 16 wherein said solubility agent is dodecanethiol.
18. An improved method for making a nanocrystal according to claim 17 wherein said semiconductor material is CdTe or CdHgTe and said capping agent is ZnS.
19. An improved method for making a nanocrystal according to claim 12 wherein said surfactant comprises acetone.
20. An improved method for making a nanocrystal according to claim 12 wherein said water soluble core has a surface and wherein said surface comprises stabilizing molecules.
21. An improved method for making a nanocrystal according to claim 20 wherein said stabilizing molecules comprise short chain thiols.

22. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 1.
23. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 2.
24. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 3.
25. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 4.
26. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 5.
27. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 6.
28. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 7.
29. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 8.

30. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 9.
31. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 10.
32. A composition of matter comprising a nanocrystal that includes a core which has a surface that is coated with an inorganic capping agent, said nanocrystal being made according to the method set forth in claim 11.
33. A composition of matter according to claim 25 wherein said core consists essentially of CdTe.
34. A composition of matter according to claim 25 wherein said core consists essentially of CdHgTe.
35. A composition of matter according to claim 25 wherein said core consists essentially of HgTe.